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Correlation of Shortening of Sternocleidomastoid Muscle with Forward Head Posture in IT Professionals

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Abstract: *Background: Forward head posture (FHP) it is the most common postural deviations observed among individuals working for long hours on computers, particularly in the IT Professional. Prolonged sitting posture and continuous screen work can lead to adaptive shortening of the sternocleidomastoid (SCM) muscle, change in cervical alignment and increasing musculoskeletal strain. Identifying the correlation between SCM shortening and FHP can help in early prevention and ergonomic correction. The study could enhance understanding of postural dynamics in IT professionals potentially leading to effective prevention and treatment strategies for forward head posture and associated musculoskeletal disorders*

Methods: The study was conducted among IT professionals aged between 25–30 years with more than 3 years' work experience. Participants with cervical fractures and non-IT backgrounds were excluded. Forward head posture was assessed using the craniovertebral angle (CVA) measured through the digital photogrammetry, and SCM muscle shortening was evaluated using the lateral flexion test. The collected data were analysed to determine the correlation between SCM muscle length and CVA.

Results: The study revealed a significant positive correlation between SCM shortening and craniovertebral angle, indicating that as the SCM muscle shortening, the degree of forward head posture increases. Participants with smaller CVA values showed greater SCM shortening, shows postural imbalance due to prolonged computer use.

Conclusion: There is significant correlation between the shortening of the sternocleidomastoid muscle with forward head posture in IT professionals. Prolonged sitting and poor ergonomic habits contribute to the muscular adaptation and altered cervical posture. Physiotherapy treatment including SCM stretching and strengthening, posture correction, and ergonomic modifications are to prevent neck dysfunction and postural strain in IT professionals..

Keywords: Forward head posture, Sternocleidomastoid Muscle, Muscle Shortening, Craniovertebral Angle, Digital Photogrammetry, IT Professionals, Postural Assessment

I. INTRODUCTION

Proper posture is a state of musculoskeletal balance which imposes a minimal amount of stress and strain on the body (1). A good posture can be defined as keeping once ear aligned with the shoulder and having the angel wings or the shoulder blades retracted.(1)Ideal posture decrease spinal stress and to be the most efficient position for the spine.(2)Forward head posture is a common faulty posture of the neck, it causes the neck to roll forward which puts abnormal pressure on the cervical spine leading to muscle imbalances . It has been widely reported among IT professionals as they keep their head forward unknowingly while using laptops which affect the head neck mechanism. (2)(3) Poor posture is traditionally associated with various musculoskeletal disorders. Forward head posture (FHP) is supposed to be associated with neck pain. (4) The sternocleidomastoid mastoid muscle is one of over 20 pairs of muscles acting on the neck. SCM has dual innervation and multiple functions. it is superficially palpable muscle with

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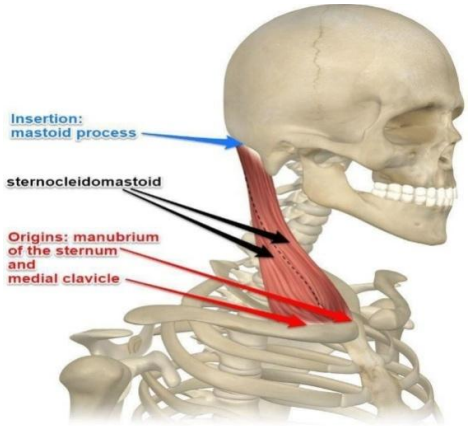
importance as an anatomical landmark within the neck region and as part of neuromuscular pathology such as torticollis.in addition, evidence from electrophysiological studies show that the SCM acts in concert with muscular group of the cervicofaciasl region, responding and aiding in various complex physiological movement beyond its principal function a lateral neck flexion (5). The SCM can also have inspiratory muscle action by taking a fixed point on the temporal bone and then lifting the sternum and the clavicles.

SCM has been playing an important role in the posture of the neck and the body. It has been shown that vestibular stimulation electrically activates the sternocleidomastoid, with evidence of a close connection between the vestibular area and the motoneurons of the SCM. It has been seen that the lateral inclination is the movement with which the SCM expresses its maximum capacity for speed and force. Another important function of SCM is allowing the correct temporomandibular joint (TMJ) function. During mastication, a trigeminal-cervical reflex stimulates the activity of SCM; there is evidence that SCM innervation is fundamental for optimal TMJ occlusion. Alteration of the mandible causes an alteration of the function of the SCM, with disorders of muscular incoordination (inclinations of the neck). During mastication on one side, the activity of the SCM is synchronous with the masseter muscle. Contrarily, with bilateral chewing, the SCM anticipates the intervention of the masseter, probably to stabilize the neck (5) The sternocleidomastoid muscle are prominent paired muscles of the neck connecting proximally the manubrium sterni and the clavicle to the mastoid process and the occipital bone distally(6).Sternocleidomastoid muscle is one of the main muscles supporting the head. (6)

Shortening of sternocleidomastoid may contribute to muscle imbalance affecting overall posture and discomfort. (7) increasing demand for faster data processing, computers and other smart devices have become an integral part of many workplaces. The sternocleidomastoid (SCM) muscle is one of the main muscles supporting the head. A review suggested that overuse of this muscle can provoke a number of complaints among the IT employees, including head and neck pain. (7) Rotation of the head to the opposite side or obliquely rotate the head.it also flexes the neck. When acting together it flexes the neck and extends the head. When acting alone it rotates to the opposite side (contralaterally) and slightly (laterally) flexes to the same side it also acts as an accessory muscle of inspiration. (7)



II. METHODOLOGY

2.1 METHODOLOGY:

- Study Design: Observational
- Target Population: IT professionals
- Sample Size: 92
- Sampling Method: Purposive Sampling
- Sampling Duration: 6 months.
- Study Setup: PCMC

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2.2 MATERIALS:

- Pen
- Paper
- Consent Form

2.3 SELECTION CRITERIA:

• INCLUSION CRITERIA:

- IT professionals >3yrs of experience (4)
- Age group 25-30 years (4)

• EXCLUSION CRITERIA:

- Fracture injury of cervical region
- Non-IT professionals

2.4 OUTCOME MEASURES (2)

- Lateral flexion test:
- Validity-0.87
- Reliability-0.96

III. REVIEW OF LITERATURE

1) Rahul S,et,al,2024, Effectiveness of Kendall Exercise for Forward Head Posture among IT Workers: To determine the effectiveness of "Kendall's exercise" among IT workers with FHP. Materials and Methods: A total of 50 subjects were selected according to inclusion and exclusion criteria and consent was obtained from participants. Cranio-vertebral angle and the Neck Disability Index were assessed as pre and post-test. The study concluded that "Kendall's exercise" had improved forward head posture among IT workers, these exercises may be useful in correcting the forward-facing posture

2) Hilla Sarig Bahat,et,al,2023, The association between forward head posture and non-specific neck pain:a cross sectional study. The study was conducted with 43 volunteers (20 asymptomatic individuals, 23 individuals with neck pain) aged 19 to 62. FHP was assessed by measuring craniovertebral angle on profile photographs. Our findings cannot support a clinically applicable association between FHP and neck pain. Additionally, individuals with neck pain had a lower range of motion and slower neck movements.

3) S Silawala,et,al,2023, The sternocleidomastoid muscle variations: a mini literature review The research shows that 48.3% of the subjects had bilateral presentation of SCM variations. If present unilaterally, three quarters of the cases were on the left side. The most frequent variation is located at the clavicular side of the proximal SCM head whereas isolated sternal sided proximal head variation or an insertional variation alone are very rare. Interestingly, with 96.6%, most of cases in the literature were discovered in cadavers during anatomical dissections. Male gender represented with 82.8% higher prevalence than females.

4) Bruno bordoni,et,al,2023,Anatomy,head and neck, hypotrophy of the sternocleidomastoid muscle (SCM) and postural abnormalities of the neck and sternocleidomastoid muscle The assessment begins with a patient sitting to observe 7 any head, shoulder and scapula, clavicle, and sternal manubrium. The patient is asked to perform some voluntary actions with the neck to evaluate motor or pain limitations and perform a forced inhalation and mimic chewing to observe how the SCM behaves. The reflexes are evaluated with a small tendon hammer at the clavicular insertion of the SCM. To assess muscle strength, the patient moves the head (flexion, rotation, and inclination) against minimal resistance applied by the examiner .Lesions affecting the SCM can affect the accessory nerve (CN XI), but they are infrequent. A lesion of CN XI causes the tendon reflex to be absent, with atrophy of the SCM and trapezius, a lowering of the shoulder, and the appearance of the sign of Sicard (increase in the depth of the supraclavicular fossa). Paralysis of SCM can cause a form of torticollis.

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5] Simona ,et,al,2022, Sternocleidomastoid Muscle and Head Position: How to Minimize Muscle Tension. this study concluded Minimal tension in SCM muscle occurs when the head is positioned in flexion, at angles between −30° and −60°. Determining the angle of minimal SCM tension provides a foundation for further research and various technical solutions that may ensure such positioning (e.g., a monitor arm). However, to obtain more accurate insight into optimal positioning, simultaneous evaluation of multiple neck muscles should be completed in future work, and the neck extensor muscle group must be addressed.

6] V.Karthik, et al,2022, Prevalence Of Forward Head Posture And Its Association With Gender, BMI And Neck Pain Among College Going Students – A Cross Sectional study The mean age of the participants was 19.8± 1.42 years. Female students were dominant by 60%.It was found that 63.3% had reduced CV angle and 36.7% had normal CV angle .BMI (p=0.003) had significant association with CV angle. The gender and neck pain had no significant association with CV angle (p>0.05).

7] Ayesha Arooj ,et , al ,2022, Forward Head Posture in Young Adults: A Systematic Review, Forward head posture is a commonly seen disorder among young adults. Investigations and interventions in time along with knowledge of postural correction can deal with this raising problem.

IV.PROCEDURE

Ethical committee clearance and permission were obtained. participants were included according to the inclusion and exclusion criteria, and consent was taken from the subjects by signing the consent form. The procedure was explained to the subjects. After filling out the consent form, the assessment proforma was completed.

1. Assessment of forward head posture

To assess forward head posture (FHP) in IT professionals, the craniovertebral angle (CVA) measurement was conducted. The subjects were seated with their feet flat, back unsupported, and looking straight ahead. The C7 vertebra and tragus of the ear were identified as reference points, and the angle was measured using a digital photogrammetry. A CVA of ⩾50° was considered normal, while ⩽39° indicated forward head posture (4)

2. Assessment of sternocleidomastoid muscle

To assess sternocleidomastoid (SCM) shortening, the lateral flexion test was performed. The subjects were positioned supine, and the SCM was palpated from its sternal and clavicular heads to the mastoid process. The opposite shoulder was stabilized, and the head was passively laterally flexed to the same side and then rotated to the opposite side. Restricted motion, early resistance, or compensatory movements indicate SCM shortening. Both sides were compared (8)

Fig1:CVA Measurment by photogrammetry

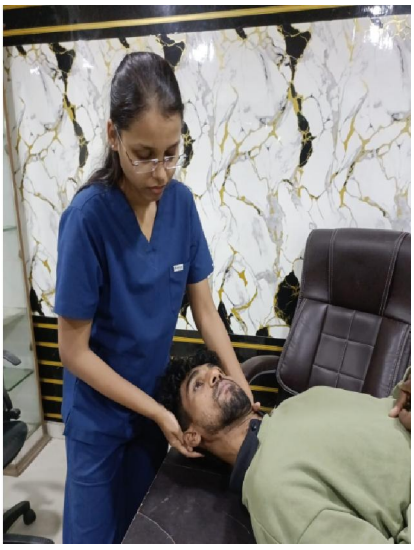

Fig2: Lateral Flexion Test for SCM Muscle

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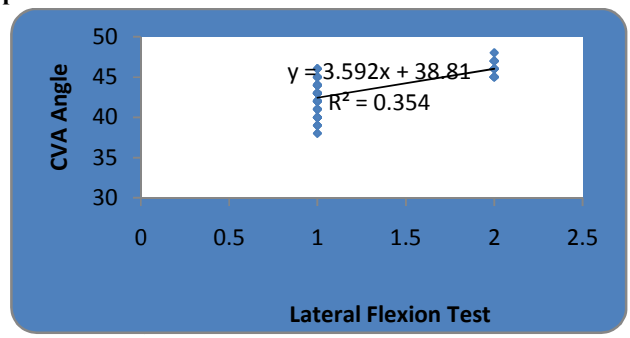
V. DATA ANALYSIS AND INTERPRETATION

Table 1: Correlation between Lateral Flexion Test and CVA angle Pearson's Correlation Coefficient

By using Pearson's Correlation Coefficient significant positive correlation was found between Lateral Flexion Test and CVA angle(r=0.596, p=0.0001).

	Mean	Std. Deviation	N	Correlation 'r'	p-value
Lateral Flexion Test	1.17	0.38	92	0.596	P=0.0001,S
CVA Angle	43.03	2.29	92		

Graph 1: Correlation between Lateral Flexion Test and CVA angle

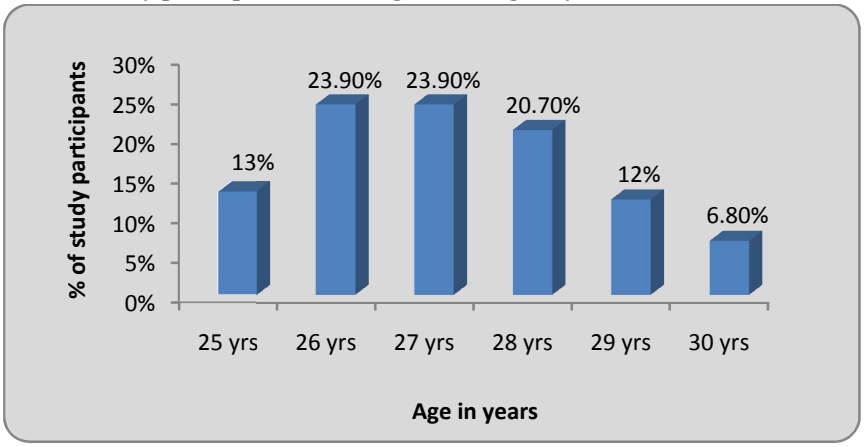


Interpretation-A significant positive correlation (r = 0.596, p = 0.0001) was found between the lateral flexion test and craniovertebral l angle, indicating that SCM shortening is directly associated with forward head posture in IT professionals.

Table 2: Distribution of study participants according to their age in years

Age Group(years)	No of study participants	Percentage
25 yrs	12	13
26 yrs	22	23.9
27 yrs	22	23.9
28 yrs	19	20.7
29 yrs	11	12
30 yrs	6	6.8
Total	92	100
Mean±SD	27.14±1.42(25-30 years)	

Graph 2: Distribution of study participants according to their age in years



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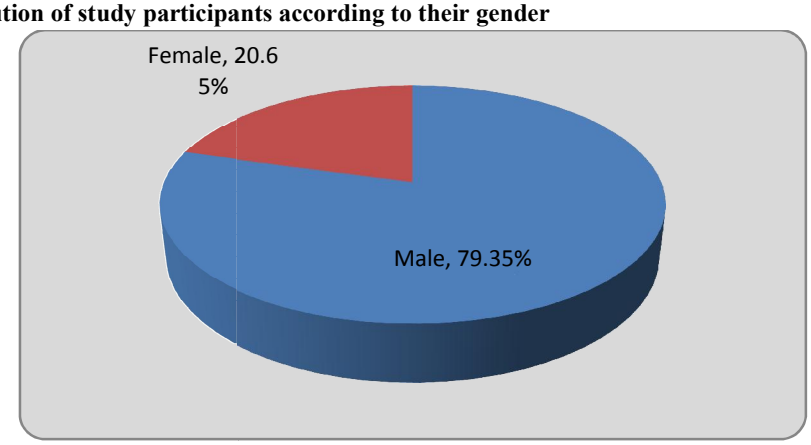
Interpretation-13% of the study participants were of 25 years, each 23.9% of them were of 26 and 27 years, 20.7% of them were of 28 years, 12% of them were of 29 years and 6.8% of study participants were of 30 years.

Table 3: Distribution of study participants according to their gender

Gender	No of study participants	Percentage
Male	73	79.35
Female	19	20.65
Total	92	100

Graph 3: Distribution of study participants according to their gender

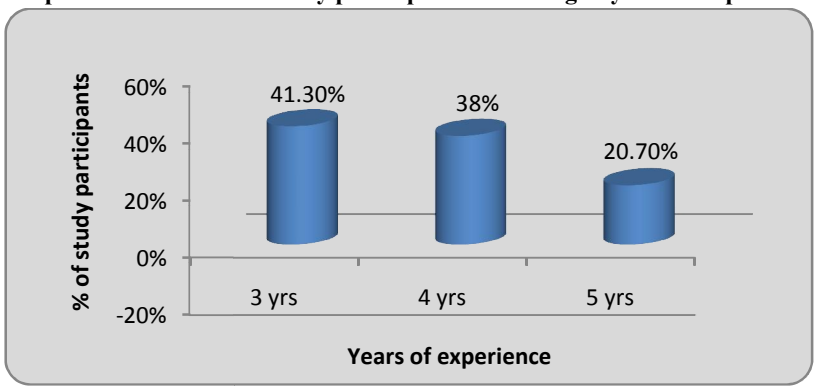


Interpretation-79.36% of the study participants were males and 20.65% of study participants were females.

Table 4: Distribution of study participants according to years of experience

Years of experience	No of study participants	Percentage
3 yrs	38	41.3
4 yrs	35	38
5 yrs	19	20.7
Total	92	100
Mean±SD	27.14±1.42(25-30 years)	

Graph 4: Distribution of study participants according to years of experience



Interpretation-41.3% of study participants had working experience of 3 years,38% had 4 years and 20.7% of study participants had years of experience 5 years.

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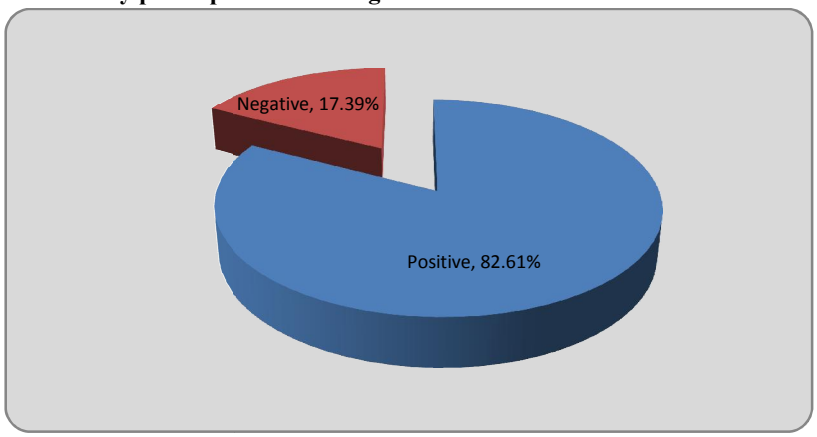
Table 5: Distribution of study participants according to lateral flexion test score

Lateral flexion test score	No of study participants	Percentage
Positive	76	82.61
Negative	16	17.39
Total	92	100

Graph 5: Distribution of study participants according to lateral flexion test score



Interpretation-82.61% of the study participants had lateral flexion test positive and 17.39% of them had negative

VI. RESULT AND DISCUSSION

RESULT: Statistical analysis showed a significant positive correlation between SCM shortening and the craniovertebral angle, meaning that as SCM shortening increased, the degree of forward head posture also increased. A significant positive correlation ($r = 0.596$, $p = 0.0001$) was found between the lateral flexion test and craniovertebral angle, indicating that SCM shortening is directly associated with forward head posture in IT professionals. 13% of the study participants were of 25 years, each 23.9% of them were of 26 and 27 years, 20.7% of them were of 28 years, 12% of them were of 29 years and 6.8% of study participants were of 30 years. 79.36% of the study participants were males and 20.65% of study participants were females. 41.3% of study participants had working experience of 3 years,38% had 4 years and 20.7% of study participants had years of experience 5 years. 82.61% of the study participants had lateral flexion test positive and 17.39% of them had negative.

DISCUSSION: The present study was conducted to determine the correlation between shortening of the sternocleidomastoid (SCM) muscle and forward head posture (FHP) in IT professionals. A total of 92 participants between the ages of 25 to 30 years were included in the study. The findings showed that the majority of the participants (23.9%) were 26 and 27 years old, with a mean age of 27.14 ± 1.42 years. This indicates that most of the IT professionals belonged to the younger working population, who are more prone to postural problems due to prolonged computer work.

The gender distribution in the study showed that 79.35% were males and 20.65% were females, However, both male and female participants were exposed to similar ergonomic and postural demands during their work hours.

The data also revealed that the majority of participants (41.3%) had three years of working experience, followed by 38% with four years and 20.7% with five years of experience. This shows that the participants had a considerable duration of professional exposure to computer-related work. Years of experience and long sitting hours were important contributing factors to the development of postural changes observed in this study

The lateral flexion test, which was used to assess SCM shortening, was positive in 82.61% of the participants, showing a high prevalence of SCM tightness among the IT professionals. This finding supports that prolonged computer work leads to adaptive shortening of the SCM muscle. Forward head posture (FHP) is one of the most common postural

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problems seen in the people working for long hours on computers. (1) The study was conducted to determine the correlation between shortening of the sternocleidomastoid (SCM) muscle and forward head posture in IT professionals. The results showed that a majority of participants had positive lateral flexion test findings, which indicates that there is SCM shortening, along with a significant reduction in the craniovertebral angle (CVA) (2). This establishes that as SCM shortens, the head moves more anteriorly ie. Forward which increasing the degree of forward head posture.

Most of the participants in this study were young adults working in the IT sector, who spend prolonged periods sitting in front of computers/laptops. This age group is more prone to postural imbalances due to occupational demands, poor ergonomics education, and lack of postural awareness. (3) The study also showed that working hours and years of experience significantly changed postural alignment. Participants with more years of experience demonstrated a smaller craniovertebral angle and increased in SCM shortening, which indicates that chronic exposure to prolonged sitting and forward head position leads to adaptive muscular changes in the neck (3).

Physiologically, when the head moves forward relative to the trunk, the line of gravity shifts anteriorly, which increases the load on the cervical spine. To stabilize the head in this forward position, the superficial neck flexors such as the SCM and upper trapezius remain in constant isometric contraction. Over time, these muscles undergo adaptive shortening, while the deep neck flexors like longus colli and longus capitis become weak and elongated (4). This imbalance causes postural deviation, reduces cervical mobility, and discomfort in the neck and causes pain in the neck. The repetitive and prolonged work nature of computer workers further contributes to this cycle of muscle shortening and weakness. (4) These findings are consistent with previous studies that have reported a strong relationship between computer use and the development of forward head posture. This study has found that individuals working more than six hours per day on computers showed a decrease in CVA and increase in neck muscle shortening. (5) Similar results were also seen in studies where increased screen time was associated with neck and shoulder discomfort and decreased muscle flexibility. The present study supports these observations by showing that IT professionals with longer working hours and poor posture showed marked SCM shortening. (6)

The shortened SCM pulls the head forward and downward, altering cervical alignment and increasing strain on posterior cervical muscles. (7) The nature of SCM means it also affects rotation and lateral flexion of the head, leading to a positive lateral flexion test as observed in this study. Participants who were working continuously without breaks showed greater SCM tightness, suggesting that lack of mobility and inadequate ergonomic adjustments accelerate muscular changes. (8) These findings highlight the importance of considering both occupational and behavioral factors in postural health. Long working hours, static sitting postures, and limited postural awareness about correct ergonomics are major contributors to the changes. (8) Even though many IT professionals are aware of the importance of proper posture, the nature of their work often prevents them from maintaining it. This emphasizes the need for workplace-based physiotherapy ergonomic awareness programs focusing on regular posture correction, stretching, strengthening and ergonomic adjustment. (9)

In physiotherapy practice, such results are valuable for developing preventive and corrective treatment programs. Regular stretching and strengthening of the SCM, upper trapezius, and pectoral muscles should be combined with deep neck flexors and scapular stabilizers to restore balance. (9) Simple postural exercises such as chin tucks, scapular retraction, shoulder shrugs and thoracic extension can improve cervical alignment and reduce the tendency of forward head posture. In addition, ergonomic modifications such as maintaining the computer at eye level, using lumbar and neck support chair, and taking short breaks every 30–45 minutes are essential to reduce static load on the cervical spine(10)The outcome of this study tells us that the previous research identified SCM overactivity and deep neck flexor weakness as primary contributors to forward head posture. Similar patterns of muscular imbalance were described by Janda in his Upper Crossed Syndrome, which was characterized by tightness in the upper trapezius and SCM and weakness in the deep neck flexors and lower scapular stabilizers.(10) This study confirms the similar postural imbalance pattern among IT professionals, suggesting that prolong computer use can change muscle length and function, resulting in postural imbalance.(11)Overall, the results of this study indicate that shortening of the sternocleidomastoid muscle is strongly associated with forward head posture among the IT professionals. The combination of prolonged sitting, repetitive visual tasks, and poor ergonomic setup leads to adaptive muscle shortening and decreased craniovertebral angle. (11)

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VII. CONCLUSION

This study concludes that there is a significant positive correlation between shortening of the sternocleidomastoid (SCM) muscle and forward head posture (FHP) in IT professionals. The findings tell us that prolonged sitting, long working hours, and increased years of experience leads to adaptive shortening of the SCM, resulting in decreased craniovertebral angle and increased forward head posture in the participants. These results highlight the importances of maintaining proper ergonomics, regular postural correction, and physiotherapy exercises such as SCM stretching and deep neck flexor strengthening to prevent postural deviations among IT professionals.

VIII. CLINICAL IMPLICATION

The findings of this study showed that shortening of the sternocleidomastoid (SCM) muscle was associated with forward head posture (FHP) in IT professionals. Physiotherapists can use this information to design specific treatment programs that include SCM stretching and deep neck flexor strengthening to correct postural. Ergonomic advice such as maintaining proper workstation height, sitting posture, and taking regular breaks were advised to the IT professionals which will help in preventing the progression of forward head posture.Postural training and awareness programs can be incorporated in workplaces to reduce the neck pain and musculoskeletal strain among IT professionals.

IX. LIMITATIONS OF THE STUDY

• This study included only IT professionals within a specific age group, which could have limited the results to other population.
• The correlation was only between sternocleidomastoid (SCM) shortening and forward head posture; other neck and shoulder muscles were not included.
• Posture assessments were based on photographic measurement, which may have minor/major human or technical errors.
• The study did not mention daily working hours, stress levels, or workstation ergonomics among participants.

X. FUTURE SCOPE OF THE STUDY

• Future studies may include other cervical and shoulder muscles to study the complete pattern of postural imbalance in individuals with prolonged computer users.
• Future research may include larger age groups with larger sample sizes.
• Future research may include physiological and pathological studies such as bone mineral density, lipid profile and hormonal changes to corelate with their quality-of-life.

XI. ACKNOWLEDGEMENT

I would like to take this opportunity to acknowledge my heartfelt gratitude to my college principal, Dr.Gajanan Bhalerao (PT) for granting me permission to carry out this project. I have had the privilege to complete this project under the supervision of Dr. Dhanashree P. Shinde (PT), who has reviewed my project constantly and extended her unconditional support, encouragement and guidance towards the timely completion of my project. I would like to thank all the participants who gave their consent to be a part of this study and cooperated for the data collection Very special thanks to my parents for creating a friendly working atmosphere for successful completion of my project. I am thankfull and fortunate enough to get constant encouragement, support and guidance from all teaching staff at TMV's Jayantrao Tilak College Of Physiotherapy, Pune, who helped me in successfully completing my project work.

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